Lab 1

In this week, we practice drawing flowcharts to know how to design a resolution strategy in order to solve the problem by computer. Students can see some sample exercises and must prepare solutions for all exercises in part B.

A. Sample exercises.

Exercise 1. Design an algorithm in flowchart to read and find maximum between 2 numbers.

Solutions:
Prototype: Max(float x, float y)
Flowchart:

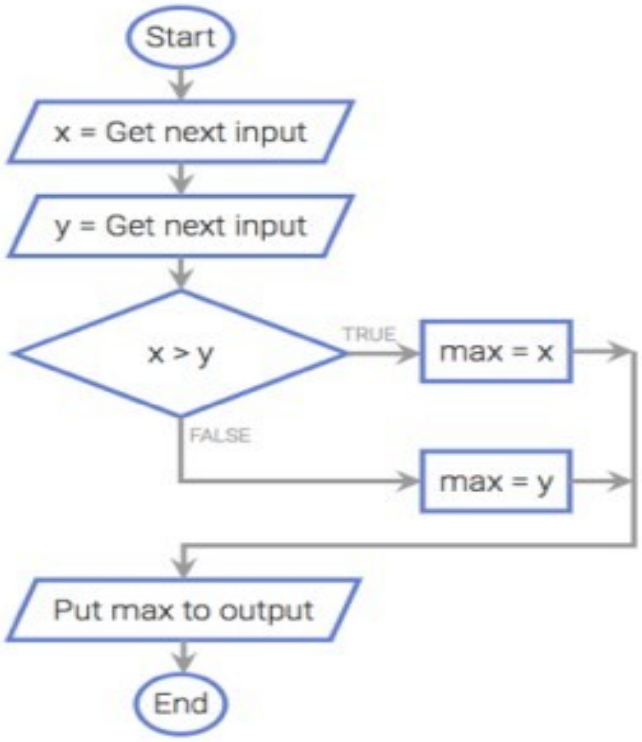

Figure 1. Determine maximum between 2 numbers

Exercise 2. Design an algorithm in flowchart to convert between meters

and inches.
(Hint: 1 inch = 2,54 cm).

Solutions:
Prototype : *floatconvert (float a,int sel);*
//*sel*=1: inches to meter, *sel* ≠1: meter to inches

Flowchart :

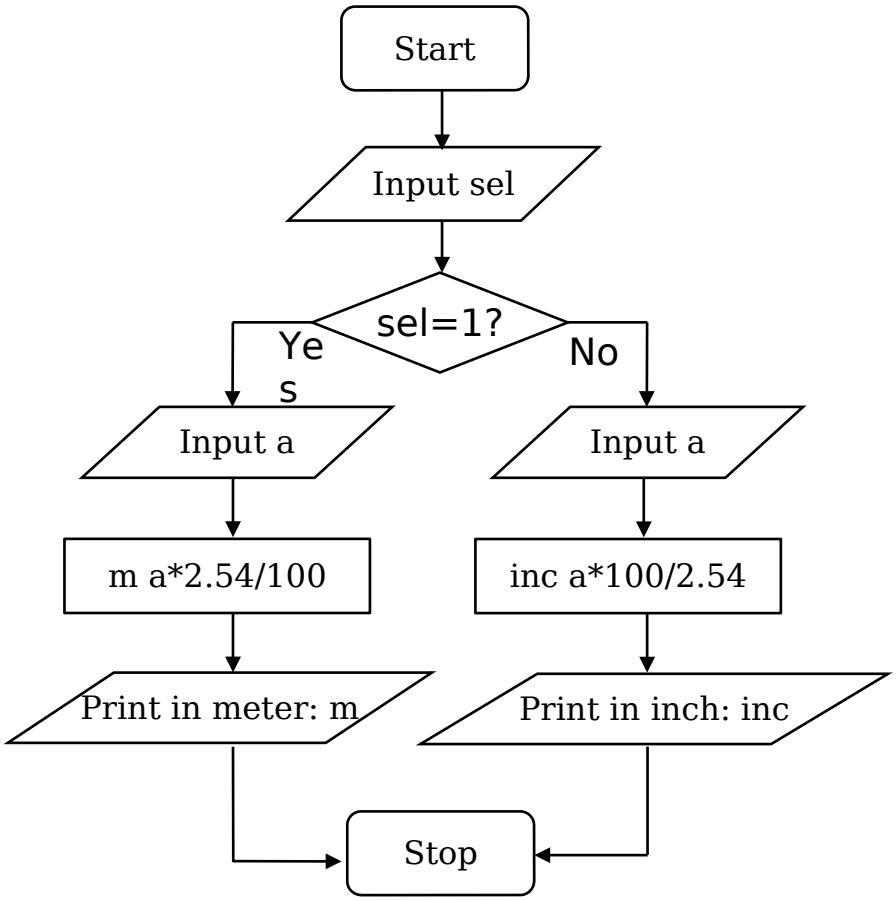

Figure 1. Converter between meters and inches

Exercise 3. Design an algorithm in flowchart to calculate the diameter, circumference, and area of the circle of radius *R*.

Solutions:
Prototype : *CircleDetail (float R);*
Flowchart :

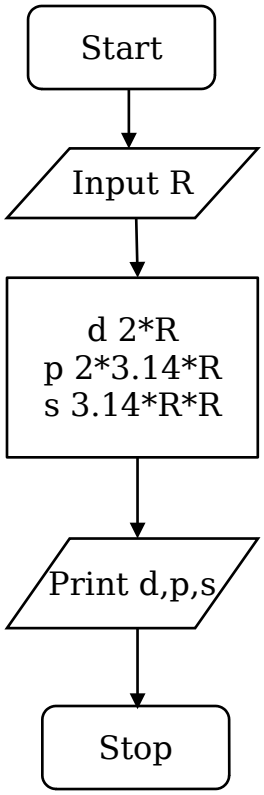

Figure SEQ Figure * ARABIC 3. Calculate diameter,

B. Exercises must to do.

Exercise 4. Design an algorithm in flowchart to find the smallest number in a group of three real numbers.

Exercise 5. Design an algorithm in flowchart to check whether a point *A(x, y)* is on, inside or outside the circle with center *O(x0, y0)* and radius of size *R*.

Exercise 6. Design an algorithm in flowchart to solve the quadratic equation: $ax^2 + bx + c = 0$ with the inputs *a*, *b*, and *c*.

Exercise 7. Design an algorithm in flowchart to read in a group of *N* numbers and compute the average of them, where *N* is also an input.

Exercise 8. Design an algorithm in flowchart to determine if a triangle is **equilateral, isosceles, right-angled or isosceles right-angled triangle** when a,b,c - the lengths of three sides of this triangle - are given.

Exercise 9. Design an algorithm in flowchart to calculate the average of four grades of four subjects of a student and determine whether students "Pass" (>=60) or "Fail".

C. Exercises in advanced.

Exercise 10. A set of linear equations:

$$aX + bY = c$$
$$dX + eY = f$$

can be solved using Cramer's rule as:

$$X = (ce - bf)/(ae - bd)$$
$$Y = (af - cd)/(ae - bd)$$

Design an algorithm in flowchart to read in *a, b, c, d, e* and *f* and then solve for *X* and *Y*.

Exercise 11. Design algorithm to check if a given year is leap year or not. (Leap year is divisible by 4 but not by 100 or divisible by 400.)

Hint: leap year is the year divisible by 4 but not divisible by 100, or it is divisible by 400.

Exercise 12. Design an algorithm in flowchart to read and calculate factorial of integer N.